

## LAB REVISION INPUT FROM CONFERENCE

Thank you all for your comments and suggestions. This was very helpful.

Number of Yes Votes: 38

Number of No Votes: 3

Number with no vote, but a comment/suggestion: 17

Comments;

1. The Idea is Great. However, what about infrastructure availability as well as cost.
2. Doesn't this disconnect the lab from the lecture- which showed better learning. Can (one) get work done in only every other week and will it be too infrequent for continuity of student learning.
3. Continuity would be a challenge, but someone at last year's BLG (or one before?) started a research project in intro where students collect data each semester for a LONGITUDINAL study: (Tina Hartley) so the setup each semester could be the same.
4. Getting Research oriented faculty involved takes their time- will they do it? Will they be rewarded? Broader impacts @ NSF- great idea. Might work for some- others would be frustrated. Generating new ideas each year might be challenging.
5. Bring faculty into research labs: You could incorporate some of the citizen science projects (frog hatch)
6. One hurdle is a set of basic skills in the Introductory course which may be required to achieve the research goals. This may be a huge time burden and supply burden (cost) for the interested faculty. One suggested alternative involves the "kitchen" type lab packages currently done with online Biology courses. In this way, the students ( all students) are able to do the same experiment(s) but not clog up the space and the cost of the kit is tagged on as the lab fee for the course. Otherwise it is a wonderful idea and may allow them to move forward in research endeavors. One question is how to (appropriately) assess the experiences for grading since all experiences differ?
7. Great idea- but I suppose you need to select faculty research ideas that correspond to lecture topics. I see a potential problem with respect to order and pay for lab supplies. Enough time to plan and order in advance each semester (especially if the "research curriculum" changes each semester as the participating faculty changes?). Bonus: students early on get introduced to faculty. Bonus: Not "canned" cookbook lab exercises. Is there enough faculty? Will this require more time/work in part of student than traditional 3 hour lab session?
8. I like the idea, but tech support may be an issue.
9. Challenging. Do it! Keep labs focused on "course" where possible.
10. We have high school students in summer who work on faculty projects, so students capable. Four different sections doing different projects, how do you deal with lab prep? Do you have enough TA's and prep people? Ownership is great! Do you know about the HHMI phagehunter program?
11. I think it will be more valuable to the nature of science learning and (to) get the students involved in research early on. There are great virtual lab programs that can be used to reiterate the basic skills that they may be missing due to the active learning of the class setup. What about basic skills; microscope

use, pipette use, measuring, plating, consistency across projects with many different students working on 1 project. Have TA's or teachers do videos/tegrityts to cover basic skill sets.

12. I think it's a great idea- My concern is whether you will have enough products that would work with students, and whether they would understand what they are doing. We spend a lot of time (insuring?) our students are getting similar experiences.

13. We do this faculty research "streams" in our Freshman Research Initiative (not in our freshman course) Good: Faculty can come up with scalable projects. Freshman can be trained to do advanced work. Problems: Equipment- each section-room has to be set up each day/week. TA training- in teaching inquiry process, in the relevant content. Matching students with the stream. But, they all take a research methods course first semester.

14. You're crazy and that's a wonderful idea- go for it.

15. Does the state mandate contact (not sure of next word) with the instructional staff for specific credit hours? If projects are different will the learning experience be different for different students? How do you align assessment with learning objectives? How do you design assessment? Do your lab TA's have expertise to effective "mentor" research? You fundamentally can't do backward design. Your course design is not based on objectives, but faculty research. Philosophically: Yes!, Logisitcally: No!!, Pedagogically NO, Experimental learning: Yes!

16. How well can you meet your two goals when the lab content is not closely correlated to lecture content? (students may not see the connection, though we do.) As you know, students really like it when lab content is closely allied with lecture content. There will be a lot of variation in the experiences of the students, which they don't like either. I'm not sure what to think about the project. It seems difficult to pull off. I'm generally in favor of it, but I'm not sure how working in one lab doing one type of project would support learning the breadth of material in the lecture. But if that isn't a concern, you will certainly make strides to reaching the other goal of helping students get research experience and ideas. —good luck- David Boz (cannot read last letter of the last name).

17. Could be very good idea, but may well be a logistical nightmare. I suggest that the outside-of-lab assignments (online, etc.) have the same deadlines for all students- really tie it to the lecture course, and make the lab course be ONLY the every-other-week meetings on real research.

18. Faculty buy-in ? Resources for type of research offered→ from faculty or from program? Will faculty want to have all kinds of student majors in their research or selected students. Big thumbs-up!

19. Great idea if you can get participation from researchers. Plus grad students buy in. Grading is an issue- How will you evaluate? Lots of work breaking multiple projects into workable 1 week units.

20. Innovative idea. Will be a logistical nightmare for the first year but if you survive the first year, then should be a lot easier. Makes the lab experience more relevant and current. Go for it!

21. Brave idea. Fantastic opportunity for students to be involved in "real" research and to analyze real data. Out of lab time will be critical to support concepts/ literature. How to provide enough

background for students to really understand implications? 1-lab (25-30 students) per question... consistency in grading? Labor intensive.

22. GOOD IDEA! We are thinking of similar idea. 1. Data quality if necessary to ultimate research. 2. Assessment across sections. 3. University protocols- i.e. will they invoke environ health safety training. Real research experience, possible author on ultimate publication, long term commitment to research.

23. I like the idea- one thought is safety issue-oriented. E.g. working with bacteria that are pathogenic? Would need to have safety training for each student. One solution to this may be to have the faculty reverse the "expt. Research problem" to be addressed using a nonpathogenic organism. Another idea- we have at our place an undergrad research journal- could your students work be published in this type of journal?

24. Thumbs up (picture of thumbs up) Great opportunity for teaching NOS. Get enough faculty support. I wonder if this will narrow the gap in achievement you currently see between labbers and non-labbers. I think some of the gain for labbers comes from interacting with content problems in labs that reinforce the lecture content. Perhaps that will come with your online portion though, but I would encourage you to associate with peer work or TA lab recitations. Social activity is powerful.

25. Yes, use real research in your laboratory sessions. Select a project that has multiple parts, so students work in a jigsaw manner, and one that doesn't cost too much. Do not expect faculty to invest in the projects because that model is not sustainable! Cloning, sequencing bioinformatics works well.

26. Interesting concept. Could be difficult to implement and coordinate all the different projects. I don't think the faculty would pay for it unless they get a clean deliverable for it. It is worth a try, perhaps you could attempt it with ½ of your sections. Sounds pretty labor intensive.

27. Great idea but feasibility questionable. On our campus would be difficult- faculty so overwhelmed they would be hesitant to buy in (of what value would it be to them). Have found that students are careless in data collection and recording. Much oversight needed and the expertise of that oversight will constantly change as projects do. Narrow down; Perhaps one long term (year) projects. One theme "climate change" and look at various aspects. That could vary over time. Will there be a common skill set that crosses all labs? So where students working in different contexts will have at least a "CORE" set skills. We do a long range (year) study that examines effect of litter, time and environment on decomp rates. Students do better work when in fact they contribute to a larger real (authentic) project.

28. On paper, this should work, but I see lots of potential problems: research perspectives of labs change with time. Faculty come and go. Uneven experience for students associated with different (labs). How are you going to handle assessment and distributing students among lab sections. I would say if you get faculty buy in, go for it.

29. Good idea, but needs structure. It will work if its structured correctly (i.e. appropriate projects, instruction to students, quality control, assessments, providing science writing experience.)

30. I like to see the lab activities tied to the lecture topics. Would it be possible to reduce the time in lab by online “pre labs” and “post labs”. Online labs are not a go(od) idea. How many different lab experiences would they be exposed to? What about hands on with different lab techniques? Does this promote biology general education? Much, much, better than no labs and could be a great change.

31. Someone at BLC-whose name I can’t recall → she is from PENN STATE and they are already doing this alternating lab/non-lab for each section because they don’t have enough lab space. Your idea is good, but logistics may be tough → how can you be sure you will get enough faculty to participate. You need firm commitments now from faculty so you can plan that you will have enough projects for all the undergraduates who need a lab experience. 1600 students is big.

32. Yes (swoosh mark).

33. I feel it would be amazing to have students work on actual lab work. This would help students learn actual lab skills that are being used in the real world. I wish you luck!

33. Clever use of time and space. Good way to get Research faculty involved in lab! Go for it.

34. In theory it sounds great. Success will depend on continuity of involvement of faculty research mentors. How will you assess whether the students have all gained the skill set (whatever that might be). Sounds like a pilot of 100 students or so is needed. At our place, there aren’t enough research projects to accommodate something like this. But, at LSU it seems that this isn’t a problem. What if it was started as a concentration in the major? Students who elect this concentration would go through a lab sequence like this. This might be a way to test this out.

35. Bad idea: Lack of (can’t read word) and quality between the different labs. Undergrads are rarely so productive as to helpfully contribute, especially within restricted time constraints. E.g. would you trust the data collection from 30 students involved in collecting data from a massive fruit fly cross? Who/ how monitor the data or analytic quality? Good idea: Make large numbers of students to be exposed to research when numbers of research faculty are not sufficient to accommodate them in a traditional experience.

36. Old Fashioned point of view from me: I think labs should coincide and support the lecture material. I cannot imagine the confusion this might cause, how weak the “players” (other faculty) would be. Your enthusiasm is contagious, but you need their buy-in, workforce, etc... and they need to “trust” results generated by these students → never. You are not asking for good students, just mainstream volunteers- Good Luck!

37. I think it works for lab science but it will be insurmountable for ecology. Hudson Bay company data is very complex to analyze, coming from someone who uses it. It is also very complex to obtain. It is a good idea as long as it allows students to do ecology if they want.

38. I would include a symposium or research presentation week to synthesize results from different projects so as to maintain some organismal, ecological, molecular etc. contacts. Labs meant to expose to some constant ideas (yes, research techniques, methods). Have students do simulated experiments

on the standard 1<sup>st</sup> and 2<sup>nd</sup> semester labs. (software based out of class). This takes care of obligatory content, real lab time fully devotes to your proposal. M. Pfeiffer.

39. Talk to Ruth Buskir at UTexas. LTER requires data to be available to public for use. Genbank provides tons of data for use by students.

40. How much faculty time would it take to get these into little projects? Experiment? Supplies? Set up? Send students to research lab.

41. 1. Will the students have a chance to be involved in experimental design- selecting independent variable etc- or will this be “cook book” experience as they just implement what a faculty member has designed? 2. How will you assure that all students have mastered basic skills like microscope use, design and use of graphs, etc... 3. Can you create some unity of experience for all students? Will all of them have some experience with an energy transformation experience, a biotechnology experience, etc...?

42. There's a website Bud Burst Re the date that plants are flowering around US

43. Involve research faculty who want to support undergraduate research. Initiate long-term projects that would continue across semesters. Bi-weekly meetings could focus on essential methods; bioinformatics, pcr/gel electrophoresis, microbial culture, microscopy, poster presentations.

44. What are the functions of labs; 1. Support conceptual understanding. 2. Learn to be a researcher which requires bench science. Brings faculty research in the lab; 1. Requires fairly structured problem. 2. Kids must be trained/reliable. 3. Data set analysis seems ideal but how many faculty have these types of data. NSF has funded microarray analysis where one institution has collected data/ another has analyzed it. (Ashland U in Ohio?). Exercise physiology is another area- kids are subjects and responsible for collecting data; diet, diet and exercise, exercise alone. (These) type (of) projects with students collecting results on themselves for that study. Learning studies are also great. Data mining experts might also help- med schools have these people.

45. What would this radical restructuring of the lab component do to the transferability of the course from University to University. What about accreditation of new curriculum by SACS? Would faculty member have a choice to accept/reject any particular student? Money from Gates Foundation?

46. Ruth Buskirk does this at UT Austin. You should definitely talk to her- Just down the road is helpful.

47. Bringing faculty's research in lab is a great idea. May be hard to coordinate supplies, etc. each semester. Why not have lab as a block course? 1<sup>st</sup> half students first part of semester. 2<sup>nd</sup> half students 2<sup>nd</sup> part of semester students get disconnected from research problem if meet only every other week.